Ethernet Modbus® TCP/IP Option Card CM090

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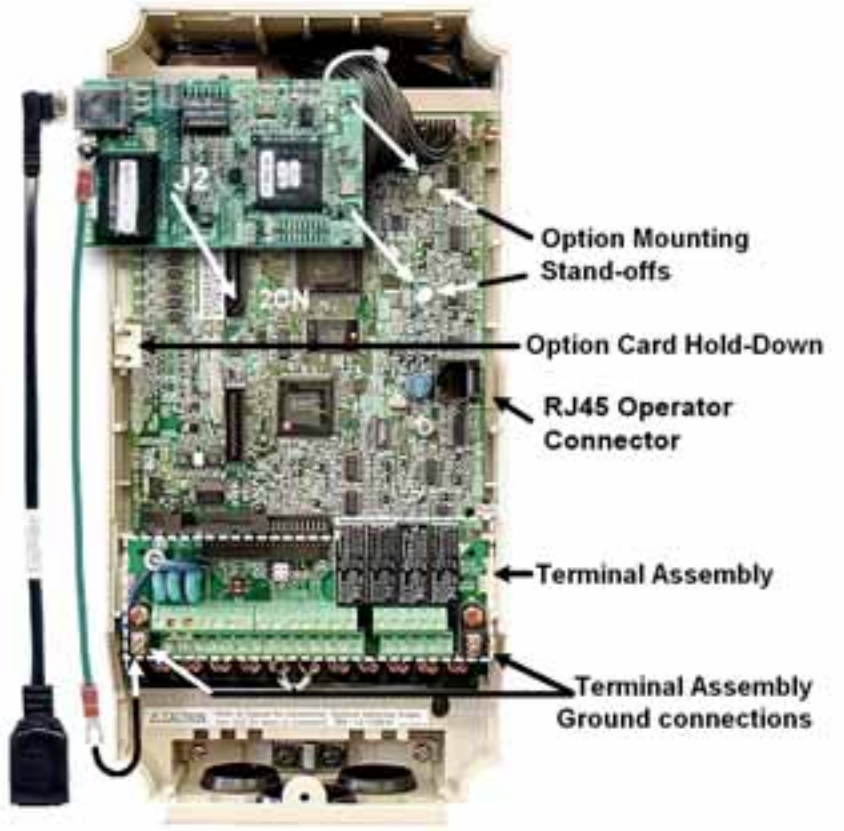
- ☐ This document applies to the Yaskawa GPD515/G5, F7, G7 and P7 drives.
- ☐ Unpack the CM090 (Ethernet Modbus TCP/IP Option kit) and verify that all components are present and undamaged.

CM090 Kit Parts	Qty.
Ethernet Option Card (UTC000041)	1
Shielded RJ45 M-F Cable (UWR00574-1)	1
Ground Wire (UWR00575-1)	1
4”x1” Insulated Tubing (M45094075004)	1
Cable Ties (UWS-0137)	2
Installation Guide (IG.AFD.25)	1

- ☐ Connect power to the drive and verify that the drive functions correctly. This includes running the drive from the operator keypad. Refer to the appropriate drive technical manual for information on connecting and operating the drive.
- ☐ Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
- ☐ Remove the operator keypad and drive cover.
  - Remove the operator keypad.
  - Remove the terminal and control covers.
  - Remove the option card hold-down by carefully compressing the top and bottom until it becomes free of its holder. Lift it out.

- ☐ Mount the *Ethernet Option* on the drive.
  - Connect the RJ45 M-F cable supplied in the CM090 kit to the *Ethernet Option*.
  - Connect the ground cable supplied to ground terminal J6 on the *Ethernet Option*.
  - Align the J2 connector on the back of the *Ethernet Option* with its mating 2CN connector on the drive control card.
  - Align the two standoffs on the front of the drive control board with the two holes on the right side of the *Ethernet Option.*
  - Press the *Ethernet Option* firmly onto the drive 2CN connector and standoffs until the J2 connector is fully seated on 2CN and the drive standoffs have locked into their appropriate holes.
  - Route the RJ45 M-F cable and the ground cable along the left-inside of the drive case.
  - Replace the option card hold down.
  - Connect the ground wire to the ground terminal on the terminal assembly.



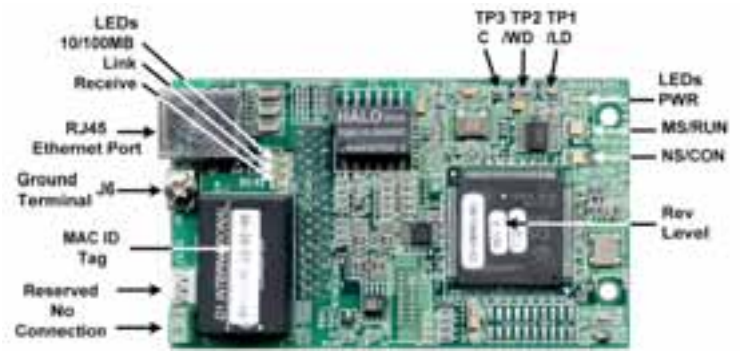
❑ Apply power to the drive and verify that the drive functions correctly.

- Verify that the MS/RUN and PWR LEDs on the Ethernet Option card are both GREEN. (Refer to the section on LEDs below)

❑ LED Definitions

The states of the *Ethernet Option* card LEDs after the power up sequence has completed are described below. Please wait for at least five seconds for the loading process to complete before verifying the status of the LEDs.

Des	Label	Description
D1	MS/RUN	GREEN – Card Functioning Normally RED – Card Failure
D2	NS/CON	GREEN – Connection Made GREEN BLINK – Control Connection Active (500ms cycle) RED – Connection Fault
D3	10/100	GREEN – 100Mbs Connection Speed
D4	LINK	GREEN – Link Established
D5	Rx	GREEN - Message Received
D8	PWR	GREEN - Appropriate Power Supplied to Card



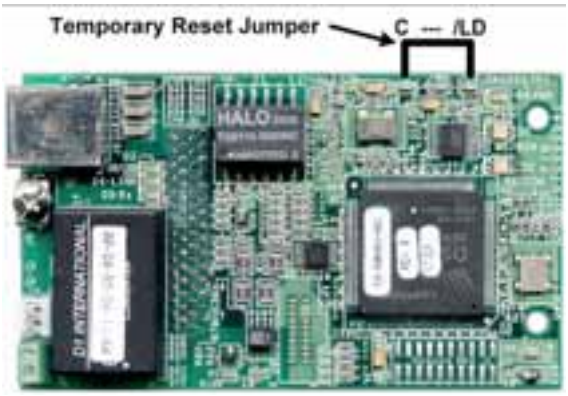
❑ Connect to the Ethernet Option.

- Due to the presence of high voltage in the area of the network connection, insulating the connection is required.
- Prior to connecting the network cable, slide the supplied insulated tubing over the female end of the supplied RJ45 M-F cable.
  - To connect directly to the *Ethernet Option*, plug one end of a CAT-5 Ethernet **cross-over** cable into the RJ45 socket on the *Ethernet Option* RJ45 M-F cable. Connect the other end to the RJ45 Ethernet socket on the configuration device, typically a controller, laptop or other PC.
  - To connect through a switch, hub or router, connect the RJ45 socket on the *Ethernet Option* RJ45 M-F cable to the switch, hub or router using a standard CAT-5 patch cable.
- After the network connection has been made, slide the insulated tubing over the connection and secure it in place using the supplied cable ties.

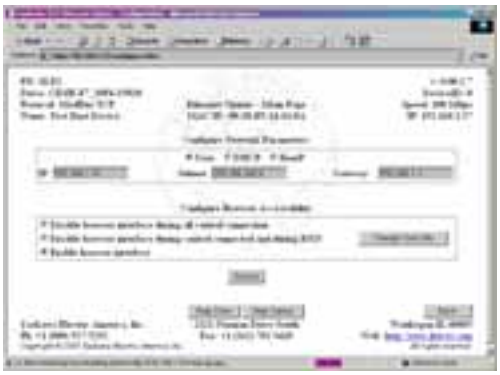
❑ Configure the PC Network Connection

- Select an existing or create a new network connection that will be used to communicate with the *Ethernet Option* card.
  - Select **Start ⇒ Settings ⇒ Network Connections** from the task bar
  - Select the network connection to be used
- Right click on the network connection and select properties from the menu
- Select **Internet Protocol (TCP/IP)** from the components displayed
  - If a TCP/IP selection is not available, it may be installed by selecting **Install.** Note that Administrator access is required and that the operating system installation CD may also be required. Consult with your IT department as needed.
- Select **Properties**
  - If the network connection already has an IP address assigned, ignore the following instructions
  - Select the **Use the following IP address** radio button
  - Enter the **IP address** as **192.168.1.19** and the **Subnet mask** as **255.255.255.0**. Check the system network schematic or with the IT department to make sure that the address does not already exist on the network.
  - Once the **IP address** and **Subnet mask** are entered select **OK**
- It may be necessary to reboot the PC in order for the changes to take affect.

- Reset the Ethernet Option to the Default Address
  - If the web page is not visible, check that the PC has been setup and connected properly. If the PC has been setup and connected properly and the web page is still not visible, the IP address of the *Ethernet Option* may not be set to its default IP address. To reset it to the default value,
    - Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
    - Place a jumper between test points **C** and **/LD** on the *Ethernet Option* card as shown in the figure to the right.
    - Reapply power to the drive and wait approximately 10 seconds for the power-up cycle to complete. You should now be able to connect to IP address 192.168.1.20 and open the main web page.
    - Remove the jumper between **C** and **/LD** on the *Ethernet Option* once the connection has been made and the web page visible.



- Configure the Ethernet Option.
  - Select the **Configure** button from the main web page.
  - Enter the desired IP address in the **IP** field and the desired Subnet Mask in the **Subnet** field. Check with the system schematic or network administrator to verify that the IP address and subnet mask entered are valid.
  - Select the **Submit** button.
  - A confirmation of the entered IP address and Subnet Mask will be displayed.
  - Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
  - If necessary, reconfigure the network connection of the configuration device to match the entered *Ethernet Option* configuration.
  - Reapply power to the drive and connect to the desired network.



- Remove power from the drive and wait for the charge lamp to be completely extinguished. Wait at least five additional minutes for the drive to be completely discharged. Measure the DC BUS voltage and verify that it is at a safe level.
- Reinstall all drive covers and the operator keypad. Apply power to the drive.
- Set parameters b1-01 and b1-02 to their appropriate values. Refer to the table to the right for available b1-01 and b1-02 values.

Param	Function	Data	+/- Limits - Description	Default
b1-01	Reference Selection	0	Digital Operator	1
		1	Terminals	
		2	Serial Communication	
		3	**Option PCB (Ethernet Modbus TCP/IP Option)**	
		4	Pulse Input (F7 and G7 Only)	
b1-02	Operation Method Selection	0	Digital Operator	1
		1	Terminals	
		2	Serial Communication	
		3	**Option PCB (Ethernet Modbus TCP/IP Option)**	

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- It is strongly recommended that shielded CAT-5 cable be used for all network cables.
- A maximum of 10 simultaneous connections are allowed.
- The RUN Command and Frequency Reference may only be accessed through UNIT ID 1. While the drive is in remote RUN mode, the RUN command must be continually refreshed within 5 seconds. If the RUN command is not refreshed within 5 seconds, an EF0 fault will occur. Refer to the appropriate drive manual for information on EF0 and setting the appropriate drive response. If a UNIT ID 1 connection is active, the NS/CON LED will blink at approximately a 500ms cycle.
- The TCP/IP connection must be refreshed within 60 seconds. If it is not refreshed within 60 seconds, the connection will be closed.
- This implementation of MODBUS TCP/IP supports MODBUS functions 3 (read multiple registers), 6 (write single register) and 16 (write multiple registers).
- Refer to the appropriate programming or parameter access manual for a complete list of drive parameters and registers available. A list of applicable manuals is available at the end of this document.
- The table below lists those registers available via high speed DP-RAM. DP-RAM access is designed to be used as part of the standard PLC I/O or scan table, where fast response is required. Other register values should be accessed via individual messages, i.e. via an MSTR block.
- Addresses 0001h and 0002h may be written while all other registers in the table below are read only. Addresses 0001h and 0002h may only be accessed through Unit ID 1 (see above).

Addr	Description		
0001h	Command	0h	Forward RUN
		1h	Reverse RUN
		2h	Multi-Function Input 3
		3h	Multi-Function Input 4
		4h	Multi-Function Input 5
		5h	Multi-Function Input 6
		6h	Multi-Function Input 7
		7h	Multi-Function Input 8 (G5/F7/G7)
		8h	External Fault (EF0)
		9h	Fault Reset
		Ah	Multi-Function Input 9 (G7)
		Bh	Multi-Function Input 10 (G7)
		Ch	Multi-Function Input 11 (G7)
		Dh	Multi-Function Input 12 (G7)
		Eh	Fault Log Trace clear
		Fh	External Base Block
0002h	Frequency Reference		
2000h	Status Word	0h	@ RUN
		1h	@ Zero Speed
		2h	@ Reverse RUN
		3h	@ Reset
		4h	@ Speed Agree
		5h	@ Drive Ready
		6h	@ Minor Fault
		7h	@ Major Fault
		8h	@ OPE Fault
		9h	@Return From Sudden Stop
		Ah	@ Remote Mode
		Bh	Multi-Function Output 1
		Ch	Multi-Function Output 2
		Dh	Multi-Function Output 3
		Eh	@ Motor 2 Selected
		Fh	@ Zero Servo Complete

Addr	Description			
2001h	Speed (U1-05)			
2002h	Torque (U1-09)			
2003h	PG Count Channel 1			
2004h	Frequency Reference (U1-01)			
2005h	Output Frequency (U1-02)			
2006h	Current (U1-03)			
2007h	Terminal 14 Output			
2008h	DC BUS Voltage			
2009h	Error Signal 1	0h	PUF	Fuse Fault
		1h	UV1	Main Circuit Undervoltage
		2h	UV2	Control Power Undervoltage
		3h	UV3	MC Fail
		4h	Reserved	
		5h	GF	Ground Fault
		6h	OC	Overcurrent
		7h	OV	Overvoltage
		8h	OH	Drive Overheat
		9h	OH1	Motor Overheat Alarm
		Ah	OL1	Motor Overload
		Bh	OL2	Drive Overload
		Ch	OL3	Overtorque 1
		Dh	OL4	Overtorque 2
		Eh	RR	Braking Resistor Fault
		Fh	RH	Braking Resistor Overheat
200Ah	Error Signal 2	0h	EF3	External Fault 3
		1h	EF4	External Fault 4
		2h	EF5	External Fault 5
		3h	EF6	External Fault 6
		4h	EF7	External Fault 7
		5h	Reserved	
		6h	Reserved	
		7h	OS	Overspeed
		8h	DEV	Excessive Speed Deviation

Addr	Description			
200Ah	Error Signal 2	9h	PGO	PG Disconnect
		Ah	PF	Input Phase Fault
		Bh	LF	Output Phase Fault
		Ch	OH3	Motor Overheat 1
		Dh	OPR	Operator Disconnected
		Eh	ERR	EEPROM Write Fault
		Fh	OH4	Motor Overheat 2
200Bh	Error Signal 3	0h	CE	Communications Fault
		1h	BUS	Option Error
		2h	Reserved	
		3h	Reserved	
		4h	CF	Control Fault
		5h	SVE	Zero Servo Fault
		6h	EF0	Option External Error
		7h	FBL	PID Feedback Fault
		8h	UL3	Undertorque Detect 1
		9h	UL4	Undertorque Detect 2
		Ah	OL7	High Slip Brake Overload
		Bh	Reserved	
		Ch	Reserved	
		Dh	Reserved	
		Eh	Reserved	
		Fh	CPF	Hardware Fault
200Ch	Analog Input A1 Value			
200Dh	Digital Input Terminals Value (Bit Field)			
200Eh	Analog Input A3 Value			
200Fh	PG Count Channel 2			
2010h	Inverter Flash ID			

Copies of this Installation Guide along with all technical manuals in ".pdf" format and support files may be obtained from either the CD supplied with the drive or from **www.drives.com** . Printed copies of any Yaskawa manual may be obtained by contacting the nearest Yaskawa office. Information on MODBUS TCP/IP may be obtained from **www.modbus.org**

Reference documents:

G5U Technical Manual – **TM.4515**

GPD515/G5 MODBUS® Technical Manual – **TM.4025**

F7U Drive User Manual – **TM.F7.01**

F7U Drive Programming Manual – **TM.F7.02**

F7U Drive Parameter Access Technical Manual – **TM.F7.11**

G7U Drive Technical Manual – **TM.G7.01**

P7U Drive User Manual – **TM.P7.01**

P7U Drive Programming Manual – **TM.P7.02**

Ethernet Modbus® TCP/IP Option Card Installation Guide – **IG.AFD.25**

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YASKAWA ELECTRIC AMERICA, INC.
Drives Division
16555 W. Ryerson Rd., New Berlin, WI 53151, U.S.A.
Phone: (800) YASKAWA (800-927-5292) Fax: (262) 782-3418
Internet: http://www.drives.com

YASKAWA ELECTRIC AMERICA, INC.
Chicago-Corporate Headquarters
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone: (800) YASKAWA (800-927-5292) Fax: (847) 887-7310
Internet: http://www.yaskawa.com

MOTOMAN INC.
805 Liberty Lane, West Carrollton, OH 45449, U.S.A.
Phone: (937) 847-6200 Fax: (937) 847-6277
Internet: http://www.motoman.com

YASKAWA ELECTRIC CORPORATION
New Pier Takeshiba South Tower, 1-16-1, Kaigan, Minatoku, Tokyo, 105-0022, Japan
Phone: 81-3-5402-4511 Fax: 81-3-5402-4580
Internet: http://www.yaskawa.co.jp

YASKAWA ELETRICO DO BRASIL COMERCIO LTDA.
Avenida Fagundes Filho, 620 Bairro Saude Sao Paolo-SP, Brasil CEP: 04304-000
Phone: 55-11-5071-2552 Fax: 55-11-5581-8795
Internet: http://www.yaskawa.com.br

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach, Germany
Phone: 49-6196-569-300 Fax: 49-6196-888-301

MOTOMAN ROBOTICS AB
Box 504 S38525, Torsas, Sweden
Phone: 46-486-48800 Fax: 46-486-41410

MOTOMAN ROBOTEC GmbH
Kammerfeldstrabe 1, 85391 Allershausen, Germany
Phone: 49-8166-900 Fax: 49-8166-9039

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, Scotland, United Kingdom
Phone: 44-12-3673-5000 Fax: 44-12-3645-8182

YASKAWA ELECTRIC KOREA CORPORATION
Paik Nam Bldg. 901 188-3, 1-Ga Euljiro, Joong-Gu, Seoul, Korea
Phone: 82-2-776-7844 Fax: 82-2-753-2639

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
Head Office: 151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, Singapore
Phone: 65-282-3003 Fax: 65-289-3003

TAIPEI OFFICE (AND YATEC ENGINEERING CORPORATION)
10F 146 Sung Chiang Road, Taipei, Taiwan
Phone: 886-2-2563-0010 Fax: 886-2-2567-4677

YASKAWA JASON (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone: 852-2803-2385 Fax: 852-2547-5773

BEIJING OFFICE
Room No. 301 Office Building of Beijing International Club,
21 Jianguomanwai Avenue, Beijing 100020, China
Phone: 86-10-6532-1850 Fax: 86-10-6532-1851

SHANGHAI OFFICE
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6553-6600 Fax: 86-21-6531-4242

SHANGHAI YASKAWA-TONJI M & E CO., LTD.
27 Hui He Road Shanghai 200437 China
Phone: 86-21-6533-2828 Fax: 86-21-6553-6677

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO., LTD.
30 Xue Yuan Road, Haidian, Beijing 100083 China
Phone: 86-10-6232-9943 Fax: 86-10-6234-5002

SHOUGANG MOTOMAN ROBOT CO., LTD.
7, Yongchang-North Street, Beijing Economic & Technological Development Area,
Beijing 100076 China
Phone: 86-10-6788-0551 Fax: 86-10-6788-2878

YEA, TAICHUNG OFFICE IN TAIWAIN
B1, 6F, No.51, Section 2, Kung-Yi Road, Taichung City, Taiwan, R.O.C.
Phone: 886-4-2320-2227 Fax:886-4-2320-2239

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